

ABSTRACT

An apparatus, system, method, and computer program and computer program product are provided for constraining the movement of a graphical hand when the physical hand controlling the graphical hand does not have a similar physical constraint. The constraining technique may comprise use and analysis of a revolute-joint-link-spring model. In such a model, an uncompressed/unextended spring position represents the corresponding measured joint angle or link position. In addition to linear springs which follow Hook's Law, i.e., $F=k*x$, non-linear springs or other non-linear force functions may be employed to obtain the desired result of allowing a graphical joint or link to deviate from what the corresponding measured joint or link provides. In particular, if a graphical hand configuration corresponding to measured joint and link positions causes a portion of the hand to penetrate a simulated graphical solid object, a mathematical determination is used to compute modified joint and link positions such that the graphical hand part will no longer penetrate the graphical solid object. Such a constraint technique may include solving a spring model such that the various joint and link springs compress or extend to produce modified joint and link positions. Such a constraint technique may also be applied to constrain other graphical body parts and graphical inanimate objects, where corresponding physical controlling, i.e., measured, body parts and inanimate objects do not possess a similar constraint or impediment.

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